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Information and Communication Technologies, eHealth and Homelessness: A bibliometric review

Fran Calvo[1,2], Xavier Carbonell[2], & Sarah Johnsen[3]

[1]FPE, Universitat de Girona

[2]FPCEE Blanquerna, Universitat Ramon Llull, Barcelona.

[3]Institute for Social Policy. Housing, Equalities Research, Heriot-Watt University, Edinburgh

ORCID Profiles:
Fran Calvo: https://orcid.org/0000-0002-0300-8548
Xavier Carbonell: https://orcid.org/0000-0002-9714-1568
Sarah Johnsen: https://orcid.org/0000-0002-3307-6111

Autor for correspondence:
Fran Calvo
fran.calvo@udg.edu
+ 34 617238344
Plaça Sant Domènec 3
17004, Girona
Spain

Abstract

A bibliometric review was conducted to assess the available scientific knowledge regarding the use of Information and Communication Technologies (ICT) by Individuals Experiencing Homelessness (IEH) and reflect on the existing evidence that ICT use has on their health. A total of 50 published articles were selected after a process of systematic review from five databases containing record of publications up until 2016. All the studies were published in English, half of the works were published in the last three years and 48% of them included the description of ICT use as an objective. Despite the fact that experimental studies were rare, and sample sizes typically small, it was concluded that the studies analyzing the effect of ICT on health display benefits. Indeed, the use of such technology offers promising opportunities to explore new ways of intervention in prevention, harm reduction and health treatment of IEH.

Keywords

Homeless person, homelessness, eHealth, ICT, social network sites, Internet

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Abstract

A bibliometric review was conducted to assess the available scientific knowledge regarding the use of Information and Communication Technologies (ICT) by Individuals Experiencing Homelessness (IEH) and reflect on the existing evidence that ICT use has on their health. A total of 50 published articles were selected after a process of systematic review from five databases containing record of publications up until 2016. All the studies were published in English, half of the works were published in the last three years and 48% of them included the description of ICT use as an objective. Despite the fact that experimental studies were rare, and sample sizes typically small, it was concluded that the studies analyzing the effect of ICT on health display benefits. Indeed, the use of such technology offers promising opportunities to explore new ways of intervention in prevention, harm reduction and health treatment of IEH.

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Homeless and ICT: Bibliometric review

Homelessness is an extreme social situation characterized by the lack of access to housing. It is a complex phenomenon, with different conceptualisations and manifestations making it difficult to establish its prevalence and study its phenomenology and effects (Busch-Geertsema, Culhane, & Fitzpatrick, 2016). There exist more restrictive definitions of homelessness, referring to living rough/out in the open (Cobb-Clark, Herault, Scutella, & Tseng, 2016) and others that are more general and which include different categories such as unsafe or inadequate housing (Busch-Geertsema, Culhane, & Fitzpatrick, 2016; FEANTSA, 2005). Even so, there does exist consensus on the fact that homelessness contributes to serious consequences in mental, physical and social health (Beijer, Wolf, & Fazel, 2012; Fazel, Khosla, Doll, & Geddes, 2008), and higher mortality and morbidity rates than amongst the general population (Fazel, Geddes, & Kushel, 2014; Noska, Belperio, Loomis, O'Toole, & Backus, 2017). Homelessness also interrupts the life of the person who is suffering it, often prompting isolation from their social circles (Shinn 2015). Further to this, it complicates communication with medical services and medical staff, making the access to ordinary medical provision more difficult (McInnes et al., 2015).

In recent years the research of the effect that Information and Communication Technologies (ICT) and eHealth initiatives have on health has proliferated, since they are an intervention with capacity to go beyond new ways of prevention and treatment, especially in mental health (Olff, 2015). In the case of groups at risk of social exclusion, it appears that the use of ICT and Social Network Sites (SNS) have the capacity to increase social contact, and, therefore, reduce the levels of loneliness and isolation (Chipps, Jarvis, & Ramlall, 2017). There also exists emerging evidence on the benefits of screening, self-care and supported employment on the programmes and applications based on eHealth (Bhui, 2017).

The aim of the current study is to analyse the pattern of scientific publications regarding the access to ICT of Individuals Experiencing Homelessness (IEH), and synthesise the results in relation to its impact. It focusses on ICT use that is either: a) on the basis of IEH's 'own initiative', that is, voluntary and spontaneous; or b) in relation to an e-Health component of a service, that is, wherein health-related information and service delivery makes use of the Internet and related technologies (Boogerd et al, 2015). The methodological design for bibliometric review proposed by Carbonell, Guardiola, Beranuy & Bellés (2009) is taken as a model.

Method

In July 2017 a systematic search of articles published until 2016 was carried out using the following databases: PubMed, PsycINFO, Scopus, Scielo and Homeless Hub. Moreover, a manual search of lists of article references was carried out. The search strategy was based on the words “homeless”, “homelessness” and “indigent”, and in MeSH “homeless person” in combination with “information and communication technologies”, “ICT”, “computer”, “2.0 web”, “online”, “phone”, “smartphone”, “social network site”, “m-health”, “mhealth”, and the MeSH word “internet” can be observed in Table 1.

[Insert Table 1 approximately here]

The following inclusion criteria were used for the selection process: articles of scientific journals with peer review methodology published until 2016 in English, Spanish or Portuguese, whose topics focused on voluntary or/and deliberate use of ICT among IEH and on the eHealth proposals. The analysis variables were classified in a spreadsheet: authorship, year of publication, affiliation with the first author, journal, methodological design, instruments and sampling, city and country of the sample, specific IEH subpopulation, sample, gender, age, recruitment institutions, principal objective, access spaces, prevalence of the ICT use and effect of the use of ICT on health. Finally the data was processed statistically with central and dispersion tendency measures.

Results

Bibliometrics

The search produced a total of 169 articles published in PubMed, 189 articles in PsycINFO, 275 in Scopus, 6 in Scielo and 5 in Homeless Hub. From the total of 644 articles, 379 duplicated articles were eliminated, which meant that a total of 265 articles were available for the analysis. After eliminating the works which did not fulfil the inclusion criteria, the search yielded a total of 50 relevant articles. Figure 1 shows the article selection flow chart, and the exclusion of papers that included low income populations but not necessarily IEH or articles that did not consider ICT as a variable. All the articles included were published in English.

[Insert Figure 1 approximately here]

Authorship

The papers were authored by a total of 175 individuals. The collaboration mean was of 3.8 authors (SD = 2.2), and the median in 3.5 authors per article (Min = 1, Q^{25} = 2, Q^{75} = 5, Max =). A total of 12.6% of the authors published more than one work on the analysed topic.

Year of publication

The first year of publication of a paper meeting the inclusion criteria was 2003. Since then a minimum of three articles have been published every year except 2004, 2007 and 2008, years in which no articles were published. In 2012 six articles were published, in 2013 four, in 2014 eight, in 2015 seven and in 2016 nine (Figure 2).

[Insert Figure 2 approximately here]

Journal

A total of 82% (n = 41) of all the journals published one work on ICT and IEH, *Computers in Human Behavior* (Eyrich-Garg, 2011; Guadagno et al., 2013), *Journal of Substance Abuse Treatment* (Freedman, Lester, McNamara, Milby, & Schumacher, 2006; Neale & Stevenson, 2014), *Journal of the Society for Social Work and Research* (Barman-Adhikari & Rice, 2011; Curry, Rhoades, & Rice, 2016) published two and *Journal of Health Communication* published three (Asgary et al., 2015; Barman-Adhikari et al., 2016; Jennings et al., 2016).

Affiliation of principal authors

Authors of 86% of the articles selected (n = 42) were registered in schools, departments or university faculties and 16% (n = 8) were registered in non-university institutions such as addictions services (Neale & Tevenson, 2014; Neale & Brown, 2015; Neale & Stevenson, 2014, 2014), non-profit organizations or science fundations (Guadagno, Muscanell, & Pollio, 2013; Kennedy et al., 2016), a library (Kelleher, 2013) and one in a technological development institution which specialises in health (Sheoran et al., 2016). The vast majority (83.3%, n=30) of the 36 main authors belonged to institutions located in North America; of these, 72.2% (n = 26) were in the United States and 11.4% (n = 4) in Canada. The rest were from Scotland (n=2), England (n=2), Spain (n=1), and Australia (n=1).

Country and city of the sample

The samples of the 38 publications were recruited in the United States of America (76.0%), 14 of which were in Los Angeles. Four were recruited in England, three in Canada, two in Scotland, one each in Spain, Uganda and Australia.

Recruitment institution

In 18 articles (36% of the total), the recruitment of the sample was carried out in shelters for IEH who were adults, homeless youths or families. In 15 articles they were recruited in drop-in agencies, in 5 in health services (one mental health centre, one health centre specialized in infectious disease, one primary care centre, one health centre specialized in veterans and one in accident and emergency services), and three on the street. In three publications the samples from the shelter and the street were combined, in two works the samples from the shelter, the street and a drop-in center were combined. Other institutions included community soup kitchens, two housing assistance programs, one programme targeting marginalised homeless youth, one women's shelter; one work recruited the samples online and the other did not specify its origin (Table 2).

[Insert Table 2 approximately here]

Methodological design, instruments and sampling

A total of 42% (n = 21) studies involved qualitative investigations (Asgary et al., 2015; Buccieri & Molleson, 2015; Bure, 2005; Byrnes, 2016; Dang, Whitney, Virata, Binger, & Miller, 2012; Fortin, Jackson, Maher, & Moravac, 2015; Gui, Forbat, Nardi, & Stokols, 2016; Hendry et al., 2011; Hersberger, 2003; Jennings et al., 2016; McInnes et al., 2015; Miller, Bunch-Harrison, Brumbaugh, Kutty, & FitzGerald, 2005; Moser, 2009; Muggleton & Ruthven, 2012; Neale & Stevenson, 2014, 2014a, 2014b; Neale & Brown, 2015; Sheoran et al., 2016; Taylor & Narayan, 2016; Woelfer & Hendry, 2011), 16% (n = 8) of the investigation were mixed-method (Bender, Begun, DePrince, Haffejee, & Kaufmann, 2014; Bender et al., 2015; Eyrich-Garg, 2010, 2011; Harpin, Davis, Low, & Gilroy, 2016; McInnes, Petrakis, et al., 2014; McInnes, Sawh, et al., 2014; Pollio, Batey, Bender, Ferguson, & Thompson, 2013) and the rest (n = 21) were quantitative investigations.

A total of 54% (n = 27) of the investigations used in-depth, semi-structured or structured interviews as a principal method (Asgary et al., 2015; Barman-Adhikari et al., 2016; Bender et al., 2014; Bure, 2005; Byrnes, 2016; Curry et al., 2016; Dang et al., 2012; Eyrich-Garg,

2010, 2011; Fortin et al., 2015; Freedman et al., 2006; Gui et al., 2016; Hersberger, 2003; Jennings et al., 2016; Kelleher, 2013; McInnes et al., 2015; McInnes, Sawh, et al., 2014; Miller et al., 2005; Moser, 2009; Muggleton & Ruthven, 2012; Neale & Stevenson, 2014, 2014ª, 2014b; Neale & Brown, 2015; Pollio et al., 2013; Redpath et al., 2006; Vázquez, Panadero, Martín, & Díaz-Pescador, 2015). The focus group was used in five studies (Bure, 2005; Byrnes, 2016; Harpin et al., 2016; Jennings et al., 2016; Sheoran et al., 2016) and observation, participant observation or other techniques in four (Buccieri & Molleson, 2015; Hendry et al., 2011; Hersberger, 2003; Woelfer & Hendry, 2011). Other methods used included case studies (Taylor & Narayan, 2016), discussion groups (Byrnes, 2016), data compilation in clinical history (McInnes, Petrakis, et al., 2014) and monitoring or automatization through mobile applications ('apps') used (Burda, Haack, Duarte, & Alemi, 2012; Freedman et al., 2006).

A total of 44% of the articles (n = 22) used surveys to define the various uses of ICT (Barman-Adhikari et al., 2016; Barman-Adhikari & Rice, 2011; Bender et al., 2015; Curry et al., 2016; Eyrich-Garg, 2010, 2011; Freedman et al., 2006; Guadagno et al., 2013; Harpin et al., 2016; McInnes, Sawh, et al., 2014; Muggleton & Ruthven, 2012; Pollio et al., 2013; Post et al., 2013; Redpath et al., 2006; Rice, 2010; Rice & Barman-Adhikari, 2014; Rice, Lee, & Taitt, 2011; Rice, Milburn, & Monro, 2011; Rice, Monro, Barman-Adhikari, & Young, 2010; Rice, Ray, & Kurzban, 2012; Rice, Tulbert, Cederbaum, Barman Adhikari, & Milburn, 2012; Stennett, Weissenborn, Fisher, & Cook, 2012; Swahn, Braunstein, & Kasirye, 2014; Young & Rice, 2011). Finally, nine investigations adjusted regression models (Barman-Adhikari & Rice, 2011; Curry et al., 2016; Redpath et al., 2006; Rice, 2010; Rice & Barman-Adhikari, 2014; Rice, Milburn, et al., 2011; Rice et al., 2010; Rice, Ray, et al., 2012; Young & Rice, 2011) and in one case a randomized controlled trial was applied (Kennedy et al., 2016).

Specific IEH Subpopulation

A total of 24 articles recruited samples of young IEH (defined as homeless youths, runaways or young adults); 13 of the articles gathered samples of adults; 9 recruited persons with mental health issues, including addiction disorders, severe mental disorders and/or dual pathology. Two works recruited samples of pregnant women or mothers; one used a sample of homeless families, and another did not specify this variable.

Sample

From the 50 articles, six used a control or comparison group (Kennedy et al., 2016; Moser, 2009; Post et al., 2013; Redpath et al., 2006; Rice, Tulbert, et al., 2012). As can be observed in Table 5, some articles shared a sample: three pairs on the one hand, and a group of three on the other hand. Bearing in mind these considerations, the total number of different participants included in the 46 sample groups of the revision was of 4,971 IEH. The mean of participants per study was of 114.5 (SD = 177.1, Rang = 1-1,046) and the median was of 56 (Min = 1, Q^{25} = 18.7, Q^{75}= 136, Max = 1,046).

Gender

A total of 10 articles did not specify the gender of the participants. From the 40 that did, it was estimated that 3,160 (64.3%) of the participants were men, 1,700 (34.6%) women and 55 transsexual (1.2%). The mean percentage of men was 89.3 (SD = 135.9, Rang = 0-735) and the median 60 (Q^{25} = 17, Q^{75} = 128). The mean for women was 50.5% (SD = 66.7, Rang = 0-284) and the median 31% (Q^{25} = 5, Q^{75} = 58). Finally, the mean percentage of transsexual individuals involved in the studies was 1.5 (SD = 6.2, Rang = 0-36).. Thirty-six works used mixed samples, two works only included men (Miller et al., 2005; Muggleton & Ruthven, 2012) and two others only women (Byrnes, 2016; Fortin et al., 2015). No differences were found regarding the number of men and women in the distribution of samples according to gender (t = 1.5, df = 68, p = .13).

Age

A total of 88% (n = 45) of the studies recorded the age of participants. Fourteen articles reported mean, standard deviation and range, seven articles included mean and standard deviation, five articles included mean and range, two articles only detailed the mean deviation, eleven only the rang and five did not provide data on the age of participants. From the 30 works which specified the age range of the sample, a total of 18 were between the ages of 13 and 26, 11 between 16 and 79 and one included participants from the age of 9 onwards (Dang et al., 2012).

Principal objective

The principal objective of 48% of the articles was the description of the use of technology that IEH made, their preferences when going online, and determining the prevalence of possession of mobile and non-mobile devices. A total of 17 articles (34%) investigated the results of different applications, software, devices or formation programs on the health of

IEH (Table 4), and nine articles (18%) analysed the connection between the 'own initiative' use of technology and the impact that this could have on the health of IEH.

[Insert Table 4 approximately here]

Findings reported in literature

Place of access

A total of 21 articles specified the places where IEH had access to ICT in their daily life (Eyrich-Garg, 2010; Freedman et al., 2006; Gui et al., 2016; Jennings et al., 2016; Neale & Stevenson, 2014b; Pollio et al., 2013; Rice & Barman-Adhikari, 2014; Rice, Ray, et al., 2012). These revealed that participants accessed ICT in public libraries (n = 12) (Eyrich-Garg, 2011; Gui et al., 2016; Hersberger, 2003; Kelleher, 2013; Miller et al., 2005; Muggleton & Ruthven, 2012; Pollio et al., 2013; Rice & Barman-Adhikari, 2014; Rice et al., 2010; Stennett et al., 2012; Woelfer & Hendry, 2011; Young & Rice, 2011), shelters or other places where services for IEH or general population were provided (n = 10) (Barman-Adhikari & Rice, 2011; Buccieri & Molleson, 2015; Bure, 2005; Hersberger, 2003; Moser, 2009; Pollio et al., 2013; Rice & Barman-Adhikari, 2014; Rice et al., 2010; Woelfer & Hendry, 2011; Young & Rice, 2011), from friends' homes (Buccieri & Molleson, 2015; Pollio et al., 2013) and from the workplace (Rice et al., 2010), and from free wifi spots via their mobile phones (Eyrich-Garg, 2010; Freedman et al., 2006; Gui et al., 2016; Jennings et al., 2016; Neale & Stevenson, 2014b; Pollio et al., 2013; Rice & Barman-Adhikari, 2014; Rice, Ray, et al., 2012) .

Use of ICT

The proportion of IEH using Personal Computers (PCs) ranged from 6% to 24% in the studies reviewed, with different studies recording different frequencies of use. The uses of PCs recorded included searching for work, refuge or housing, leisure, or communicating with people. Regarding the use of mobiles, the percentage of those owning any device ranged from 6 to 100%, and a smartphone specifically from 29.3 to 83.3%. The proportion using ICT daily ranged from 45.5 to 100%. The primary purpose was of mobile use was to communicate with other people or access information via the Internet. The percentage using the internet varied between 9.3% and 96.5%, and purposes of use included communicating with other people, searching for work and enjoying leisure and free time. The proportion of IEH possessing an email account ranged between 5.3% and 72.2%. Finally the proportion

accessing (any) SNS ranged between 7.0% -75%, with the most popular SNSs used were Facebook, with an access range of 4.9%-71.8%, Myspace, with an access of 27.3% at the time of carrying out the study, and Twitter (10.0%-12.2%) (Table 5).

[Insert Table 5 approximately here]

Effect of ICT on health

A total of 32 articles reported on the effect of ICT on health, six articles on the effect of ICT on the relationship of IEH with health services, six on drug dependence, five on the prevention of sexually transmitted diseases, five on general mental health and psychology, and one on women's health. Moreover, five articles, (10%) reported relational and socio-educational results. The principal conclusions drawn across these were that ICT: a) provided means for IEH to search for social support (Pollio et al., 2013); b) fostered communication with proactive and positive peers which facilitated acquisition of social capital benefits (Rice & Barman-Adhikari, 2014); c) was effective in the following of processes between patients and health services professionals (Kennedy et al., 2016), d) helped IEH to acknowledge values, set personal goals, accept help, and adopt more positive communication with other people (Hendry et al., 2011); and e) were considered the communicational centre for relationships and social capital away from the hard condition of living in the streets (Neale & Brown, 2015).

Five articles (10%) described the preferences of IEH when considering the design of eHealth interventions. According to Post et al. (2013) the health issues that interested IEH the most were those related to drug dependence, mental health, gender-based violence or quitting smoking. The work of Asgary et al. (2015) indicated that IEH (especially women) preferred to receive health messages on the phone, short in length, or with visual and motivational messages, and to surf health websites. Jennings et al. (2016) concluded that eHealth programs for IEH should be adapted (not require signing up or other mail management), authentic at a communicational level (that is, should not involve automated calls) and are confidential. The preferent topics in eHealth were HIV testing, nourishment, mental health and pregnancy prevention.

On this subject, McInnes et al. (2015) concluded that: a) the preferences of IEH in eHealth proposals were receiving appointment reminders and keeping in contact with health

professionals; b) IEH did not appreciate automatic calls as they consumed minutes of their credit and generated confusion; c) IEH considered asynchronous communication via text messages less intrusive than personal calls, d) IEH valued messages reminding them of appointments and/or providing prescriptions or laboratory results. Finally, Stennet et al. (2012) concluded that the most efficient way to contact IEH was in person, although ICT (email and mobile phone) provided an efficient and effective complement to face-to-face communication (Table 6).

[Insert Table 6 approximately here]

Discussion

The object of this study was to review the academic literature assessing the effect of ICT on people experiencing homelessness and consider the implications for eHealth and other health initiatives. We have observed an annual increase in the number of articles published on the effect of access to ICT on IEH's health, continuing the trend previously reported by McInness, Li & Hogan (2013) and La Sala & Mignone (2014).

The annual increase in the number of articles published on the effect of access to ICT on IEH's health is indicative of growing interest in the uses and applicability of ICT by IEH, as is also true for levels of interest in eHealth among the general population (Srivastava, Pant, Abraham, & Agrawal, 2015). That said, only five authors have published more than one article on IEH and ICT as a main author, and twenty-two as co-author. Most authors published only one article about the field, suggesting that there may be a lack of continuity in the study of the relationship of ICT use by IEH. It is perhaps surprising that an emerging phenomenon which has great possibilities of future scientific exploration displays such low continuity, although, on the other hand it is not a fact which is limited to the investigation of the use of technology by IEH, as there are substantial gaps of knowledge in other specific fields highly studied in the general population such as, for example, suicide and autolytic behaviours (Christensen & Garces, 2006).

The literature in use of ICT by IEH is strongly dominated by studies conducted in the USA, despite the fact that the prevalence of the homelessness phenomenon is similar in the USA and some countries in the European Union such as The United Kingdom or Italy (Toro et al., 2007). There is no doubt that this situation indicates an importat knowledge gap. It is

necessary to increase the range of publications with European samples to attend to the economic, legal, family and cultural differences existing in the different continents and which could mediate in the use of technology by IEH (Pleace, 2016) as is the case in other aspects of homelessness (Toro et al., 2007). Further to this, the investigation methods to date have been mainly descriptive, employing, almost equally, qualitative and quantitative designs. The lack of clinical tests and experimental methodologies indicate important gaps in knowledge, and the need for further research in this field. It would be valuable to incorporate the ICT tools in ordinary treatment and to design randomized controlled trials as the example of Calvo & Carbonell (2018) that demonstrated learning to use Facebook in comparison with a control group could improve the psychological well-being of IEH. This example highlights the potential benefits offered by educational and psychosocial interventions incorporating ICT.

Despite these limitations, the extant literature indicates that the use of ICT by IEH is widespread and, furthermore, that it offers substantial potential benefits for their wellbeing. The more recent publications suggest that the use of ICT by IEH has progressively increased, as was expected from the progressive universalization of ICT because the improvement and advance of connectivity and the fact that access costs have decreased (Latulippe, Hamel, & Giroux, 2017). On the other hand, the evidence reviewed suggests that there were differences in levels and means of use between different subpopulations, such as pregnant women, young people, war veterans, and people with mental issues or addictions. Homeless youths, the most analyzed sub-population in this review, were the ones who accessed technology more frequently, especially SNS, and did so in ways and to the same extent as their peers in the general population (Calvo et al., 2018; Guadagno et al., 2013). In accordance with the emergent paradigms questioning the digital divide, whilst most IEH use ICT, access is unstable and characterized by frequents periods of disconnection (Gonzales, 2016). This generates questions regarding how public services and providers can incorporate ICT tools to fully exploit the benefits they offer.

For many IEH, the Internet is most frequently accessed via the free wi-fi spots in cities. The number of spots has increased in the last twenty years (Anthopoulos, 2017) and this fact facilitated the digital connection of IEH (Calvo & Carbonell, 2017). There exist great similarities in the motivation and frequency of access, which leads to thinking that the digital differences between housed and homeless members of society have reduced progressively

(Guadagno, Muscanell & Pollio, 2013). The greatest difference between both populations is that IEH access more in public places than private homes, which indicates the importance of public access to technology (Pollio et al., 2013).

ICT use offers a number of benefits to IEH, most notably manifest in potential improvements in psychological wellbeing, the impact of access to information on reducing levels of stress amongst those living on the street, and the benefits found in virtual contact with other people, as is also true for other groups at risk of social exclusion (Díaz Andrade & Doolin, 2016; Novo-Corti, Varela-Candamio, & García-Álvarez, 2014). Rice and collaborators point out that virtual contact with families, home-based peers and home-based friends or other people through SNS has a protective effect in reducing risk behaviour amongst IEH (2010, 2011, 2012, 2014). Thus access to ICT is linked to positive relationships which increase protective factors and improve inclusion in social worlds beyond their immediate communities (Roberson & Nardi, 2010).

The studies reviewed also provide evidence that eHealth proposals have a positive effect on IEH. ICT can increase self-management in chronic patients, encourage appointment follow ups, increase mental health therapy adherence and follow up, and be the best support for adherence to antipsychotic medicine (Burda et al., 2012). The difficulty to adhere to treatment, especially in mental health, can be compensated with proposals like that reported in Burda (2012), which after one initial assessment reports a total adherence of participants in psychiatric medication. It must be noted that ICT should be seen as complementary to rather than a potential replacement for face-to-face interaction with IEH in health-related interventions (Byrnes, 2016). Bearing in mind the mentioned advantages, it is important to improve connections, especially in marginal areas, and improve Internet access speed. These measures would contribute to reduce inequalities regarding the need to be always connected for eHealth proposals, as they require immediate connection that IEH do not have on many occasions (Woelfer & Hendry, 2011). It is also worth considering the possibility of providing mobile devices in certain cases, so that eHealth interventions do not depend on random possibilities of individuals to access, as is the case with interventions used, for example, to control glucose in diabetic people (Cho, Lee, Lim, Kwon, & Yoon, 2009).

This review has some limitations. Firstly, three works published in other languages were excluded, but may have provided valuable information, especially regarding ICT use in

developing countries (Flowerdew & Li, 2009). Most works focus on the experience of IEH in the USA, so we have limited information in this phenomenon in other parts of the world. Also, sources of grey literature have not been included. In fact, with the same search strategy used, 34 other references were detected including PhD thesis, proceedings in congresses, books or government reports. Finally, the studies analyzed displayed, in general, small samples, and the presence of experimental or quasi-experimental works that reported information on the effect of ICT on the health of the homeless was almost non-existent. This serves to highlight the need for prudence when interpreting the proposed results, and a need for further research.

In conclusion, ICT is widely used by and has an important impact upon the lives of IEH, when used via their own initiative and/or as part of instrumentalized eHealth proposals. Access to the Internet from non-mobile devices and mobile devices is a powerful source of communication and information for IEH to increase the management of their own health, improve social and psychological operating patterns, and facilitate access to and maintenance of engagement with healthcare services. Although it appears that the use of ICT by IEH offers multiple opportunities and benefits as a complement to regular intervention of social care and health providers, it is important to continue working to improve understanding regarding how this might be maximised to improve health outcomes for this vulnerable population group.

Conflict of interests

Not declared.

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About the autor

Fran Calvo is a lecturer in social education and psychology and currently manages the Harm Reduction Programs for the Public Health Agency of Catalonia in the town of Girona. He holds a Social Education degree, an Educational Psychology degree, a postgraduation in Communitarian Development, a postgraduation in Health Psychology and is PhD candidate in Psychology for the Universitat Ramon Llull in Barcelona (Catalonia). Presently he works in the expansion of the needle exchange programs for persons who inject drugs in Catalonia and he develop the first smartphone application for these population. He worked for 12 years with individuals experiencing homelessness where he acquired the interest to use Information and Communication Technologies and Social Networking for homeless people. His research areas included homelessness and ICT use, drug abuse of extreme social exclusion populations and and harm reduction programs and services.

Public interest statement

Information and Communication Technologies are a basic need for people around the world. The use of social networking, and ehealth applications through mobile devices or computer has been increasing last 15 years. People in extreme social exclusion situations like individual experiencing homelessness are not outsiders of this situation and their use of ICT increase possibilities of communication and access to value information. The study proposes to analyse what we know currently about the use of ICT by individuals experiencing homelessness. Using a systematic scientific literature review this study explores the current scientific knowledge about ICT access and eHealth use of homeless people.

Table 1.

Search strategy used in the different data bases

Data base	**Search strategy**
Pubmed	(("homeless persons"[Mesh] OR "homeless"[All Fields] OR "homelessness"[All Fields] OR "indigent"[All Fields]) AND ("information and communication technologies"[All Fields] OR "ICT"[All Fields] OR "computer*"[All Fields] OR "web 2.0"[All Fields] OR "online"[All Fields] OR "phone"[All Fields] OR "smartphone"[Majr:noexp] OR "internet"[Mesh] OR "social network site"[All Fields] OR "m-health"[All Fields] OR "mhealth"[All Fields]) AND ("0001/01/01"[PDAT] : "2016/12/31"[PDAT])) AND (hasabstract[text] AND "humans"[MeSH Terms])
PsycINFO	homeless persons"[Mesh] OR "homeless"[All Fields] OR "homelessness"[All Fields] OR "indigent"[All Fields]) AND ("information and communication technologies"[All Fields] OR "ICT"[All Fields] OR "computer*"[All Fields] OR "web 2.0"[All Fields] OR "internet"[All Fields] OR "online"[All Fields] OR "mobile phone"[All Fields]
Scopus	(((TITLE-ABS-KEY("information and communication technologies")

	OR TITLE-ABS-KEY("computer") OR TITLE-ABS-KEY("internet") OR TITLE-ABS-KEY("online") OR TITLE-ABS-KEY("phone") OR TITLE-ABS-KEY("mobile phone") OR TITLE-ABS-KEY("smartphone") OR TITLE-ABS-KEY("mhealth") OR TITLE-ABS-KEY("ehealth") OR TITLE-ABS-KEY("ICT")) AND ((TITLE-ABS-KEY("homeless*") OR TITLE-ABS-KEY("indigent"))) AND ((LIMIT-TO(AFFILLANGUAJE, "English) AND ((LIMIT-TO(AFFILLANGUAJE, "Spanish)) AND ((LIMIT-TO(AFFILLANGUAJE, "Portuguese))
Scielo	(homeless OR homelessness OR indigent) AND (online OR internet OR social network sites OR web OR social network sites OR health OR m-health) AND la:("en" OR "es")
Homeless Hub	"web" OR "computer" OR "online" OR "mhealth" OR "m-health" OR "social network sites" OR "Information and Communication technologies" OR "mobile phone"

Table 2.
Context of investigation and location of principal authors and samples.

	Filiations of authors		**Sample locations**	
	University: schools, faculties and/or departments	**Non-university institutions.**	**City (State); Country**	**Type of institutions of recruitment.**
Asgary et al. (2015)	Public health	-	New York City (NY); USA	Shelter
Barman-Adhikari & Rice (2011)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Barman-Adhikari et al. (2016)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Bender et al. (2014)	Social work	-	Los Angeles (CA); USA	Shelter
Bender et al. (2015)	Social work	-	Los Angeles (CA); USA	Shelter
Buccieri & Molleson (2015)	Sociology	-	Toronto; Canada	Specific shelter for street you
Burda et al. (2012)	Nursing	-	Baltimore (MD); USA	Street
Bure (2005)	Science and technology	-	Edinburgh and Glasgow; Scotland	Mental health services
Byrnes (2016)	Nursing	-	Elizabeth (NJ); USA	Urgency service for women
Curry et al. (2016)	Social work	-	No specified city or state (Western USA)	Drop-in agencies
Dang et al. (2012)	Nursing	-	Sacramento (CA); USA	Drop-in agencies
Eyrich-Garg (2010)	Social work	-	Philadelphia (PA); USA	Street
Eyrich-Garg (2011)	Social work	-	Philadelphia (PA); USA	Shelter
Fortin et al. (2015)	Public health	-	Toronto; Canada	Street
Freedman et al. (2006)	Psychology	-	No specified city (Alabama, USA)	Not reported
Guadagno et al. (2013)	-	Science foundation	New York City (NY) and Los Angeles (CA); USA	Shelter
Gui et al. (2016)	Engineering and informatics	-	Los Angeles (CA); USA	Soup kitchen
Harpin et al. (2016)	Nursing	-	Denver and Colorado Springs (CO); USA	Shelter, street and drop-in agency
Hendry et al. (2011)	Computer and	-	Seattle (WA); USA	Drop-in agencies

	information			
Hersberger (2003)	Library and information	-	Indianapolis (IN), Seattle (WA) and Greensboro (NC); USA	Specific shelter for families
Jennings et al. (2016)	International health	-	Baltimore (MD) and Washington DC; USA.	Intervention program in unserved communities of homeless youth
Kelleher (2013)	-	Library	Lansing (MI); USA	Shelter
Kennedy et al. (2016)	-	Behavioral Policy Sciences	Los Angeles (CA); USA	Housing program
McInnes, Petrakis, et al. (2014)	Public health	Veterans hospital	Providence (RI); USA	Veterans health centre
McInnes, Sawh, et al. (2014)	Public health	Veterans hospital	Providence (RI); USA	Primary care centre
McInnes et al. (2015)	Public health	Veterans hospital	Boston (MA); USA	Housing program
Miller et al. (2005)	Occupational therapy	-	Philadelphia (PA); USA	Long-stage shelter
Moser (2009)	Engineering and informatics	-	Calgary (Alberta); Canada	Shelter
Muggleton & Ruthven (2012)	Computers and information	-	Glasgow; Scotland	Shelter and street
Neale & Brown (2015)	-	Addiction service	No specified cities (England)	Shelter
Neale & Stevenson (2014)	-	Addiction service	No specified cities (England)	Shelter
Neale & Stevenson (2014a)	-	Addiction service	No specified cities (England)	Shelter
Neale & Stevenson (2014b)	-	Addiction service	No specified cities (England)	Shelter
Pollio et al. (2013)	Social work	-	Denver (CO) and Los Angeles (CA); USA	Shelter, street and drop-in agency
Post et al. (2013)	Medicine	-	New Haven and Bridgeport (CT); USA	Health emergencies
Redpath et al. (2006)	Behavioral research and services	-	Long Beach (CA); USA	Infectious disease centre
Rice (2010)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Rice & Barman-Adhikari (2014)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Rice, Lee, et al. (2011)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Rice, Milburn, et al. (2011)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Rice et al. (2010)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Rice, Ray, et al. (2012)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Rice, Tulbert, et al. (2012)	Social work	-	Los Angeles (CA); USA	Drop-in agencies
Sheoran et al. (2016)	-	Technology development	Oakland (CA); USA	Shelter
Stennett et al. (2012)	Medicine	-	Los Angeles (CA); USA	Feed service
Swahn et al. (2014)	Public health	-	Kapala; Uganda.	Shelter
Taylor & Narayan (2016)	Technology	-	Sydney; Australia	Online recruitment
Vázquez et al. (2015)	-		Madrid; Spain	Shelter and street
Woelfer & Hendry (2011)	Computers and information	-	Seattle (WA); USA	Shelter and street
Young & Rice (2011)	Infectious diseases	-	Los Angeles (CA); USA	Drop-in agencies

Table 3.
Sample, gender and age of participants of the selected articles.

	SP*	n	Sample and gender Men n (%)	Women n (%)	Trans. n (%)	Age M, ED (Rang)
Asgary et al. (2015)	A	50	21 (42)	29 (58)	-	51.7,11.3 (25-79)
Barman-Adhikari & Rice (2011)	Y	169	114 (68.2)	53 (31.8)	-	20.9, 2.1 (13-24)
Barman-Adhikari et al. (2016)	Y	1,046	735 (70.3)	275 (26.3)	36 (3.4)	21.3, 2.16 (13-25)
Bender et al. (2014)	Y	98	60 (61.2)	36 (36.7)	3 (3.1)[a]	19.0, 0.8 (17-20)
Bender et al. (2015)	Y	48	32 (66.7)	15 (31.3)	1 (2.1)[a]	19.1, 0.7 (18-20)
Buccieri & Molleson (2015)	Y	12	NR[b]	NR	NR	(18-23)[c,d]
Burda et al. (2012)	M	10	8 (80)	2 (20)	-	(21-64)[c,d]
Bure (2005)	A	16	15 (93.7)	1 (6.3)	-	30.2[d,e]
Byrnes (2016)	W	10	-	10 (100)	-	(18-21)[c,d]
Curry et al. (2016)	Y	539	391 (72.4)	159 (27.6)	-	21.1, 1.9 (14-24)
Dang et al. (2012)	Y	149	76 (51)	73 (49)	-	(9-24) [c,d]
Eyrich-Garg (2010, 2011)[f]	A	100[b]	73 (73.0)	27 (27.0)	-	45, 10.0[e]
Fortin et al. (2015)	W	5	-	5 (100)	-	20.2, 2.28 (18-24)
Freedman et al. (2006)	M	30	11 (37)	19 (63)	-	38, 6.2[e]
Guadagno et al. (2013)	Y	86	31 (36.0)	54 (62.8)	1 (1.2)	19.4, 1.09[e]
Gui et al. (2016)	A	14	NR	NR	NR	(17-70)[c,d]
Harpin et al. (2016)	Y	18[g]	133 (73.5)	41 (22.7)	7 (3.8)	20.6, 0.2[e]
Hendry et al. (2011)	Y	75	NR	NR	NR	(13-25)[c,d]
Hersberger (2003)	F	25	NR	NR	NR	NR
Jennings et al. (2016)[h]	Y	52	21 (40.4)	31 (59.6)	-	21.4[d,e]
Jennings et al. (2016)[h]		41	11 (26.8)	30 (73.2)	-	18.1, 0.4 (15-24)
Kelleher (2013)	A	121	NR	NR	NR	(<21-50)[c,d]
Kennedy et al. (2016)	A	60	74%[i]	26%[i]	-	NR
McInnes, Petrakis, et al. (2014); McInnes, Sawh, et al. (2014)[f]	M	21	17 (81.1)	3 (15.0)	1 (4.9)	55[d] (25-68)
McInnes et al. (2015)	M	30	26 (86.6)	3 (13.4)	-	53.6, 8.3 (33-65)
Miller et al. (2005)	A	7	7 (100)	-	-	35[d] (21-47)
Moser (2009)	A	13[j]	NR	NR	NR	NR
Muggleton & Ruthven (2012)	A	18	18 (100)	-	-	NR
Neale & Stevenson (2014, 2014a, 2014b)[f]	M	30[k]	25 (83.3)	5 (16.7)	-	43[d] (23-62)
Neale & Brown (2015)	M	30[l]	21 (70.0)	9 (30.0)	-	38[d] (21-54)
Pollio et al. (2013)	Y	100	67 (67.0)	33 (33.0)	-	20.4, 1.8 (18-24)
Post et al. (2013)	A	249[m]	136 (54.6)	113 (45.4)		40.0[d] (18->65)
Redpath et al. (2006)	M	265[n]	186 (70.2)	79 (29.8)	-	43.6, 8.7[e]
Rice (2010)	Y	103	60 (58.3)	43 (41.8)	-	20.9, 2.2 (16-26)
Rice & Barman-Adhikari (2014)	Y	194	128 (66.0)	66 (34.0)	-	21.1, 2.1[e]
Rice, Lee, et al. (2011)	Y	169	111 (65.7)	58 (34.3)	-	20.9, 2.1 (13-24)
Rice, Milburn, et al. (2011)	Y	136	81 (60.5)	55 (39.5)	-	(16-25) [c,d,o]
Rice et al., 2010; Young & Rice (2011)[f]	Y	201	133 (66.2)	62 (30.8)	6 (3.0)	21, 2.1 (13-24)
Rice, Ray, et al. (2012)	Y	136	81 (60.5)	53 (39.6)[p]	-	20.8, 2.1(13-24)

Rice, Tulbert, et al. (2012)	Y	60[q]	37 (61.7)	23 (38.3)	-	22.8, 1.8[e]
Sheoran et al. (2016)	Y	6	3 (50.0)	3 (50.0)	-	(18-25)[c,d]
Stennett et al. (2012)	A	39	NR	NR	NR	NR
Swahn et al. (2014)	Y	415	129 (31.1)	284 (68.4)	-	(14-24)[c,d,r]
Taylor & Narayan (2016)	-	1	NR	NR	NR	NR
Vázquez et al. (2015)	A	188	158 (84.0)	30 (16.0)	-	47.57, 12.2[e]
Woelfer & Hendry (2011)	Y	80	NR	NR	NR	(13-25)[c,d]

NR = Not referred
[*]SP = Subpopulation of homelessness A = Adults, Y = Homeless youth, teenagers and young adults, M = Mental health and addictions, W = Homeless women pregnant or young mothers, F = Families.
[a]Transsexual not specified, "other" use instead.
[b]Not reported.
[c]Mean not reported.
[d]Standard deviation not reported.
[e]Rang not reported.
[f]Articles that use the same sample.
[g]The initial sample was 191, but 10 cases were excluded for not following inclusion criteria.
[h]Study which has two samples. One first sample of participants distributed in 9 focus group (n = 52) and a second sample of participants in individual interviews (n = 41).
[i] Absolute number not specified, only the percentage.
[j]The total of the sample was 42 but the rest were not IEH.
[k]The sociodemographic data was obtained in a first interview. In the second interview, which provides some results, 22 IEH participate.
[m]Sample of IEH compared with 5,539 non-IEH (accident and emergency patients not included in this description).
[n]It is reported that only 230 reported their IEH condition.
[o]The authors claim that 83.7% of the sample are between ages of 18 and 22 years old.
[p]Data reported about gender not clear.
[q]The initial sample is 163 but only 60 people were IEH.
[r]Authors specify: 42.1% (n = 175) are <18 years, and 57.1% (n=237), =>18.

Table 4.

Objectives of the research.

	Objectives of the papers included in the review
Asgary et al. (2015)	Evaluate the perceptions the experience of the use of mobile phones in health care.
Barman-Adhikari & Rice (2011)	Evaluate the use of Internet and SNS to search information on sexual health.
Barman-Adhikari et al. (2016)	Determine the prevalence of use of SNS and type of connections and conversations in relation to risk/protective sexual behaviour.
Bender et al. (2014)	Evaluate the usefulness of ICT to increase retention in longitudinal studies and their connection preferences.
Bender et al. (2015)	Evaluate a pilot test of the electronic youth management to homeless youth.
Buccieri & Molleson (2015)	Describe an experience about their participation in the design of an app to increase the Internet use of other IEH.
Burda et al. (2012)	Evaluate the reliability of mobile phones to monitor adherence to pharmacological treatment in mental health.
Bure (2005)	Investigate how ICT are used in daily life and how this affects their social integration.
Byrnes (2016)	Determine whether the Text4baby app is seen as adequate to provide health information to young mothers.
Curry et al. (2016)	Determine what factors predict the use of the Internet to seek housing, employment or health resources compared to face-to-face.
Dang et al. (2012)	Check the acceptability of a historical online clinical system.
Eyrich-Garg (2010)	Describe the use of mobile phones and their influence on access to social support networks.
Eyrich-Garg (2011)	Analyze the use of computers and the potential benefits or risks in relation to their quality of life.
Fortin et al. (2015)	Explore the most relevant topics about the conditions of life as IEH.
Freedman et al. (2006)	Analyze the feasibility of using mobile phones in the treatment of cocaine addicts..
Guadagno et al. (2013)	To compare if the use of SNS is similar between IEH and university students of the same age.
Gui et al. (2016)	Determine the degree of possession of digital devices, access to ICT and their influence on their lives.
Harpin et al. (2016)	Explore the prevalence of mobile phone use and social media use.
Hendry et al. (2011)	Evaluate ICT skill training and its impact on personal and emotional skills and competencies.
Hersberger (2003)	Know the needs of access to information and ICT resources in their daily lives.
Jennings et al. (2016)	Examine their access and use to mobile phones, and collect their preferences and suggestions for the design of an mHealth intervention.
Kelleher (2013)	Examine the use of the services offered by libraries.
Kennedy et al. (2016)	Improve motivation to reduce drug use and reduce HIV risk behaviors through an online motivational program
McInnes, Petrakis, et al. (2014)	Analyze the reliability of the use of text messaging with mobile phones to increase the retention rate to health services.
McInnes, Sawh, et al. (2014)	Develop a text message system for mobile phones to increase attendance of scheduled visits to primary care services.
McInnes et al. (2015)	Determine the accessibility to ICT of veterans and their interest to communicate in this way with health services.
Miller et al. (2005)	Explore the experience of using computers and their meaning after a job placement workshop (occupational therapy).
Moser (2009)	Understand how they adopt technology and how the production of online texts can be related to the personal structure.
Muggleton & Ruthven (2012)	Explore how ICT access affects and how it can be related to the formation of identity and social interaction.
Neale & Brown (2015)	Explore participation through ICT and its potential capacity in the recovery of drug dependence and online treatment.
Neale & Stevenson (2014)	Explore the characteristics of a therapy in addictions online through the computer.
Neale & Stevenson (2014a)	Explore the acceptance of online therapy in drug addiction, assisted by computer.
Neale & Stevenson (2014b)	Explore the role that friendship plays in your life and how ICTs get involved in these relationships.
Pollio et al. (2013)	Explore their use of technology and what risk factors associated with homelessness predict such use.
Post et al. (2013)	Compare the use of the mobile phone after going to the emergency room and the demands of health information.
Redpath et al. (2006)	Describe Internet access to determine the effectiveness potential of online interventions.
Rice (2010)	Examine whether the relationship through SNS with other young people with healthy behaviors reduces exposure to risky sexual behaviors.
Rice & Barman-Adhikari (2014)	Establish what type of connections they make and how they influence the search for online resources.
Rice, Lee, et al. (2011)	Examine the prevalence of mobile phone use and the health implications of its social and instrumental use.
Rice, Milburn, et al. (2011)	Examine how the differences in the composition of the social bond may be related to drug use.
Rice et al. (2010)	Analyze the association between sexual health and the use of internet and SNS to find a sexual partner.
Rice, Ray, et al. (2012)	Analyze if the integration in street and home-based networks with the help of ICT improve the results in anxiety and depression.
Rice, Tulbert, et al. (2012)	Examine the acceptability of an HIV prevention program through the SNS.
Sheoran et al. (2016)	Develop a mobile application to improve access to health resources.
Stennett et al. (2012)	Determine the predominant behavior for the search of information and the most efficient contact method with health services.

Swahn et al. (2014)	Determine the prevalence of mobile phones and the psychosocial characteristics that differentiate between those who have and those who do not.
Taylor & Narayan (2016)	Follow the activity on Twitter of an IEH to determine the type of use it makes of the social network.
Vázquez et al. (2015)	Analyze access to ICT and its main uses.
Woelfer & Hendry (2011)	Determine if access to ICT improves the chances of "escaping" from those conditions in relation to the classic information system.
Young & Rice (2011)	Analyze the relationship between seeking sexual partners through SNS with risk behaviors of transmission of viral diseases.

Table 5.
Prevalence of use of ICT, dispositive and/or Internet.

	Computers	Mobile phones	Internet	SNS
Asgary et al. (2015)	-	78% has a working cell with the possibility to send and receive text messages.	-	-
Barman-Adhikari & Rice (2011)	61.0% used it on some occasion to search health 61.0%, 47.3% about STD, 40.7% about sex and 23.% about testing of VIH.	-	54.4% every day	66.4% connected with housemates, 52.7% street peers, 47.9% with online acquaintances and 34.1% with parents.
Barman-Adhikari et al. (2016)	-	-	-	79.2 used them on some occasions. 32.7% several times a day or daily, 23.9% several times a week or once a week, 19.1% less than once a week and 20.7% never. 56.1% with friends from home, 49.7% with family, 36.1% with Street friends and 33.1% with boyfriends, girlfriends or partners.
Curry et al. (2016)	-	-	72.5 % used it periodically.	-
Eyrich-Garg (2010)	-	44% have a mobile and 35% are owners. Use to communicate with family and friends.	9% access through the mobile.	
Eyrich-Garg (2011)	47% used the computer in the last month. 26% to search employment, 18% for leisure or surf the Internet, 7% to have access to SNS, 7% to edit or process texts 5% to look for housing.	-	47% use it habitually.	7% accessed SNS habitually
Guadagno et al. (2013)	-	-	-	75% used them periodically.
Harpin et al. (2016)	-	46.7% owned a mobile phone and 29.3% owned a smartphone.	-	71.8% used SNS (Facebook). 12.2% used Twitter and 10.0% other SNS.
Hersberger (2003)	76% did not know how to use the computer. 24%	-	24.0% on some occasion.	

	used it occasionally to search information.			
Jennings et al. (2016)	-	85.0% had a mobile. From the 32 persons that had a mobile, 30 used SMS, 29 multimedia messages and 27 Internet.	-	-
McInnes et al. (2015)	-	90% had one, of which 30% were smartphones. Mainly they are used to keep contact with friends and family, check appointments on the calendar, find work[a].	70% used Internet to keep in contact with friends and family, manage work issues, look at bank accounts, contact health services and leisure. 72% had email.	-
Miller et al. (2005)	57.1% had never used a computer until the course began.	-	-	-
Moser (2009)	Use for leisure, connect with friends and family, reduce stigma associated to homelessness, surf on internet listen to music, find work, develop small personal projects,training courses, and look for work.[a]	-	-	-
Muggleton & Ruthven (2012)	Objective to communicate and spend leisure time and find information[a.]	-	-	-
Neale & Stevenson (2014)	66.0% used the computer every day. 6.7% had never used it. 23.3% had their own laptop.	86.7%had a mobile phone, 20% of which were smartphones	-	33% have active Facebook accounts, though they were not used very periodically.
Neale & Brown (2015)	-	It is the most common device to contact friends, especially by phone calls.	18.2% used internet to contact friends through SNS.	18.2% used Facebook mainly to contact other IEH who had moved and with whom direct contact had been lost.
Pollio et al. (2013)	They use it an average of 2.8 days per week (ED 0 2.6).	6% have access to a mobile phone.	They connect an average of 4.6 days per week (ED = 2.5), and to check email an average of 3.8 days (ED = 2.7). The aim of 56% is to communicate, of 46% to look for work, and 36% leisure.	22% access to SNS an average of 3.8 days per week (ED = 2.8). 71% use it to contact friends and 55% the family.
(Post et al., 2013)	-	70.7% have their own phone, 30.5% smartphones. 70,2% use it to make calls, 50.6% to type SMS, 32.5% access the internet through their phone, 20.9% look for health information), 6.4%) use health apps 29.7%) send emails, 26.1% listen to music, 24.5% play games, 22,9% use apps, and 9.3% watch videos online.	59% use Internet regularly and 45.4% use email.	41.0% are SNS users and 26.9% use them through their mobile phone.

Redpath et al. (2006)	55.1% had used the computer before in their life. 24.6% had owned one.	-	19% have accessed internet in the last 30 days and 9.9% had sent or received an email in the last 30 days. 24.2% had email.	
Rice (2010)	-	-	-	The use of SNS to interact with housemates was over 50%[a].
Rice & Barman-Adhikari (2014)	-	-	30.5% used it that same day, 31.1% the previous day, 10% two days before 12.1% some days before and 16.3% over a week before. 63.9% connected to check their email.	52.2% to check their SNS (Facebook, Myspace), 27.3% to watch videos on Youtube, 27.84% to look for work and 12.9% to look for housing.
Rice, Lee, et al. (2011)	-	62% have a mobile phone (40% a work phone, 15% a phone without credit to call, 7% share with a friend). 100% use it at least once a day. The aim of 50.9% is to contact friends or people close to the home, 42.6% with siblings, cousins or other relatives, 41.4% with other relatives, 37.9% with street peers, 24.3% with potential employers, 23.1% with people they had met online, 17.2% with care staff (social workers) and 11.8% with current employers.	-	-
Rice, Milburn, et al. (2011)	-	-	75% use internet and SNS habitually.	43% connected with a home-based peer who did not consume drugs 31% with drug consuming home based peers. 32% contacted with non-consuming relatives and 18% had drug-consuming relatives in their social network.
Rice et al. (2010)	-	-	Use Internet on some occasion, 96.5%. 84% at least once a week. 44.8% use email to contact home based peer or home based friends, 36.8% to contact friends or friends made online, 42.3% with the extended family, 40.8%with Street based peers or Street based friends and 18.9% with parents.	18.9% used them to contact with direct family, 42.3% with extended family, 59.7% with home based friends, 40.8% with street based friends and 42.8% with people they have met online.
Rice, Ray, et al. (2012)	-	-	-	Made an average of 1.54

				(ED = 2.21) contacts online with home based peers, 0.59 (ED = 1.22) with home based friends, 0.57 (ED = 1.15) with street based peers and 0.38 (ED = 0.89) with street based friends.
Sheoran et al. (2016)	-	100% had a mobile phone, of which 83% were smartphones.	-	-
Stennett et al. (2012)	-	53.8% had a mobile phone.	-	-
Swahn et al. (2014)	-	45.5% had a mobile phone and used it daily 54. 5% did not have one or used it weekly or less often.	9,3% used internet and 5,3% had email.	4,9% used Facebook.
Vázquez et al. (2015)	-	75.4% of the 30.8% of the sample used it (up to 42 years old) , 50.8% of 35.1% of the sample (43 to 52 years old) and 56.5% of the sample (over 52 years old).	70.2% of 30.8% of the sample used it (up to 42 years old) , 32.3% of the 35.1% of the sample (43 to 52 years old) and 16.1% of the sample (over 52 years old). 59.6%, 32.3% and 12.9% respectively had email.	35.1% of 30.8% of the sample used it (up to 42 years old),17.2% of 35.1% of the sample (43 to 52 years old)and 1.6% of the sample (over 52 years old).
Young & Rice (2011)	-	-	-	78.7% connected weekly and 44.6% daily. 78.1% to Myspace, to 29.9% Facebook and 10% to Twitter (10.0%).

[a] Percentages are not included.
[b]46% use any ICT daily and 93% at least weekly.

Table 6.
Summary of the main results and conclusions related with health and eHealth proposals.

Topic		Principal results and conclusions.
Relationship between care-providers and IEH.	Burda et al. (2012)	The mobile phone improved adherence to medication with patients with mental health issues.
	Dang et al. (2012)	Online clinical history system was adequate to increase knowledge and management of health aspects.
	McInnes, Petrakis, et al. (2014); McInnes, Sawh, et al. (2014)	App message text was efficient to increase presence in follow up medical appointments and reduced visits to A&E.
	K. McInnes et al. (2015)	Internet was useful to contact with IEH from the health services.
	Sheoran et al. (2016)	App to locate health services was considered useful by IEH.
Prevention of infectious diseases. Protection factors.	Barman-Adhikari & Rice (2011)	Receive information through SNS about health and contact with family were elements that increase protecting factors to catch VIH.
	Rice (2010)	Contact through SNS with people who used protective measures against risk of VIH contagion, the use of condom increased.
	Rice et al. (2010)	The contact through the SNS with the family or home-based friends, increased the protective factors that minimize the risk of HIV infection.
	Rice, Tulbert, et al. (2012)	The use of SNS increased retention in a program that requires continuation to be effective in preventing the spread of sexual infectious diseases.
	Young & Rice (2011)	The contact through the SNS with family and friends decreased the risk behaviors of HIV infection, such as exchanging things by sex or not to test.
General mental health and psychology	Eyrich-Garg (2011)	The use of SNS was related to a lower presence of risk behaviors such as consuming drugs, considering HIE, sleeping on the street or time in a homelessness situation.
	Gui et al. (2016)	The use of the computer and the Internet mentally distanced the IEH from the harsh conditions of life on the street. The participants themselves described it as a protective factor in mental health.
	Miller et al. (2005)	The functional uses of the computer in IEH that had never used them increased the perception of self-esteem, self-efficacy and motivation.
	Muggleton & Ruthven (2012)	The use of the Internet improved general mental health: it relaxes, relieves and disconnects from life on the street. The perception of self-esteem increased.
	Neale & Stevenson (2014)	An increase in contacts in SNS with home-based friends was associated with a decrease in depression symptoms.
Drug addiction	Freedman et al. (2006)	The use of the mobile phone was considered effective to monitor the craving or other elements related to the disorder due to cocaine dependence and for the treatment.
	Kennedy et al. (2016)	Program through the SNS useful to reduce behaviors that negatively impact on health such as drug use and sexual risk behavior.
	Neale & Brown (2015)	The analysis of the potentialities of the use of ICT to incorporate in the treatment of drug addictions presented potentialities at the communicational level.
	Neale & Stevenson (2014)	The evaluation of a therapy directed to the treatment of addictions, assisted by computer, reported good results in efficacy and applicability.
	Neale & Stevenson (2014)	App of online treatment of drug addiction reduced the drug consumption of the participants.
	Rice, Milburn, et al. (2011)	The contact by SNS used to be with people with healthier behaviors. That contact was related to a lower consumption of drugs.
Women	Byrnes (2016)	Text4Baby app effective and effective with homeless-women to improve knowledge of pregnancy and upbringing of babies.

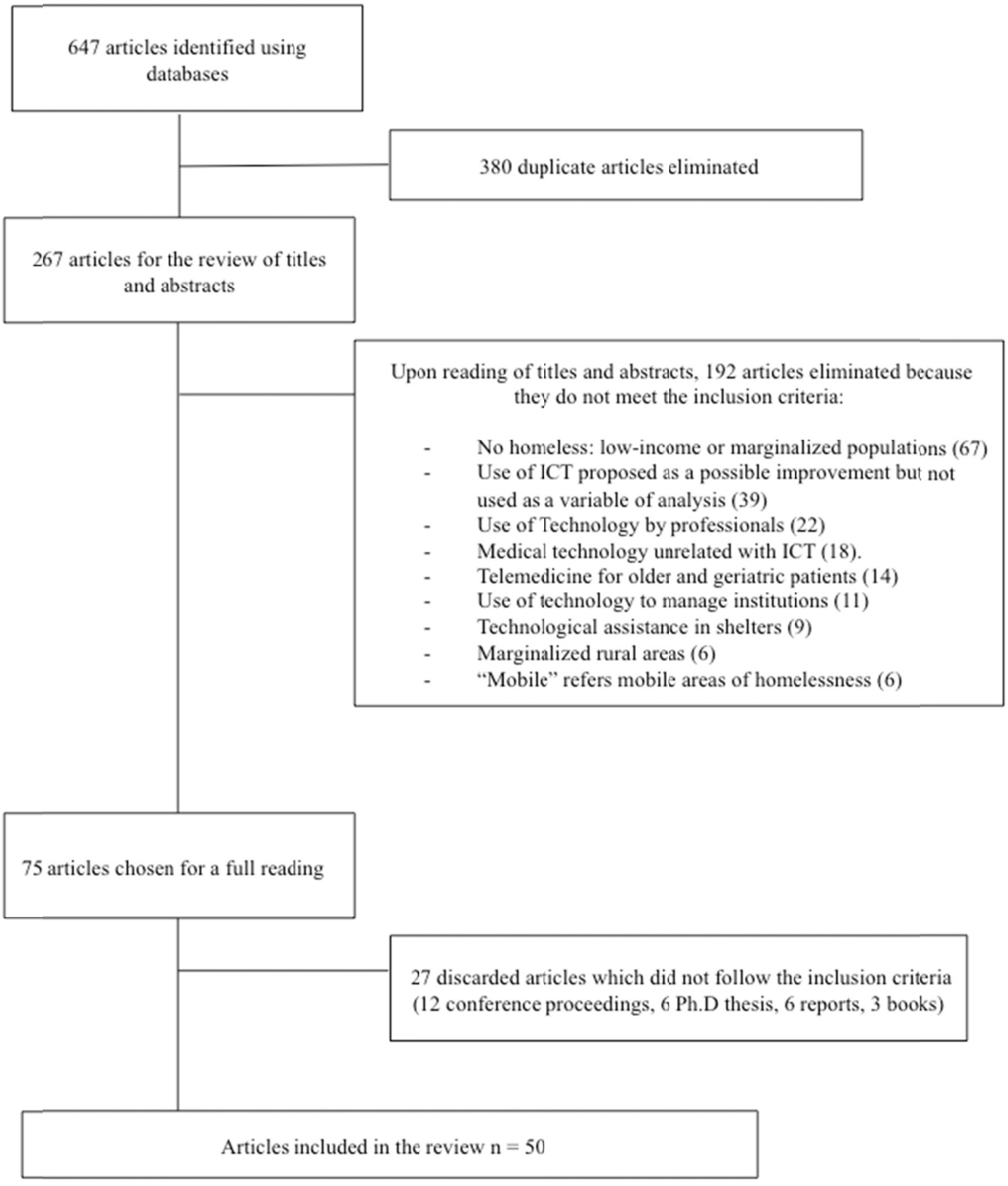
647 articles identified using databases
380 duplicate articles eliminated
267 articles for the review of titles and abstracts
Upon reading of titles and abstracts, 192 articles eliminated because they do not meet the inclusion criteria:
- No homeless: low-income or marginalized populations (67)
- Use of ICT proposed as a possible improvement but not used as a variable of analysis (39)
- Use of Technology by professionals (22)
- Medical technology unrelated with ICT (18).
- Telemedicine for older and geriatric patients (14)
- Use of technology to manage institutions (11)
- Technological assistance in shelters (9)
- Marginalized rural areas (6)
- "Mobile" refers mobile areas of homelessness (6)
75 articles chosen for a full reading
27 discarded articles which did not follow the inclusion criteria (12 conference proceedings, 6 Ph.D thesis, 6 reports, 3 books)
Articles included in the review n = 50

Fig 1

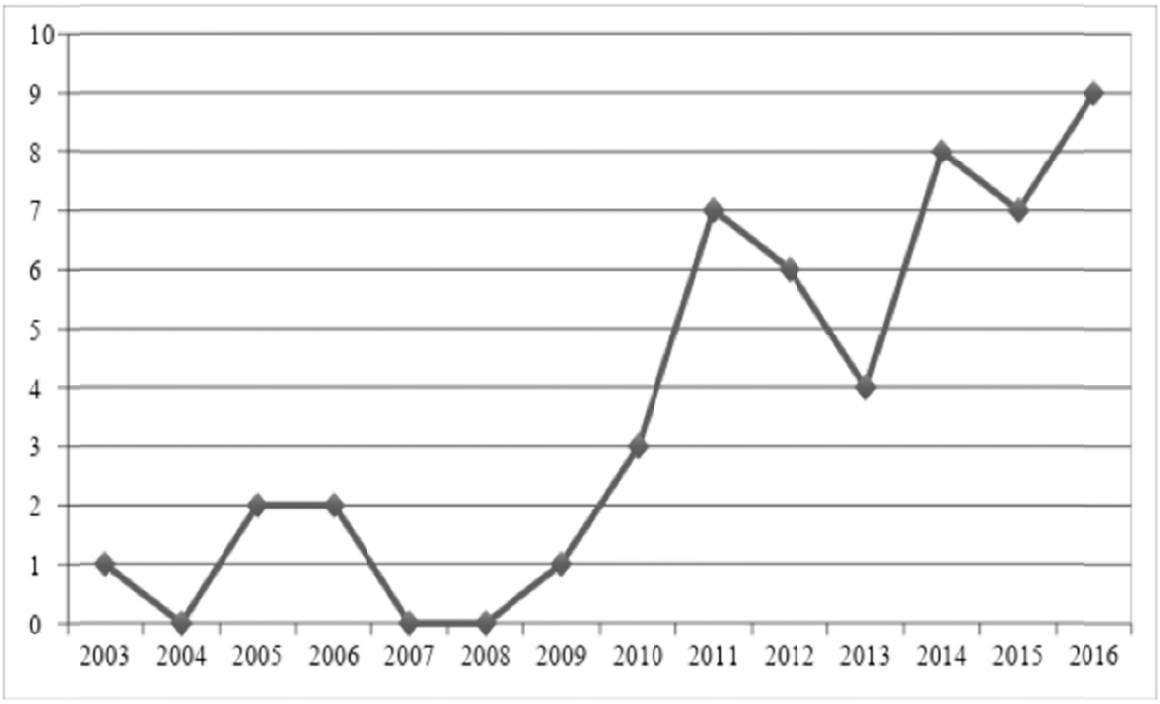
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Fig 2

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